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TIMBER MANAGEMENT PLAN

GENERAL TIMBER MANAGEMENT STATEMENT

SAN JUAN NATIONAL FOREST

COLORADO

Region 2

1961

REGION TWO

FOREST SERVICE

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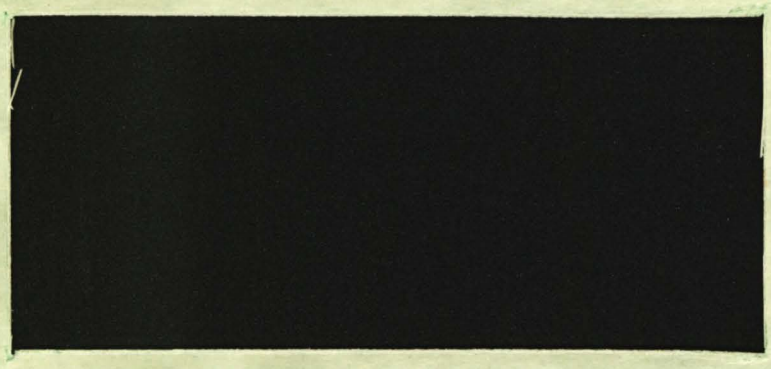

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GENERAL TIMBER MANAGEMENT STATEMENT

SAN JUAN NATIONAL FOREST

COLORADO

Region 2

1961

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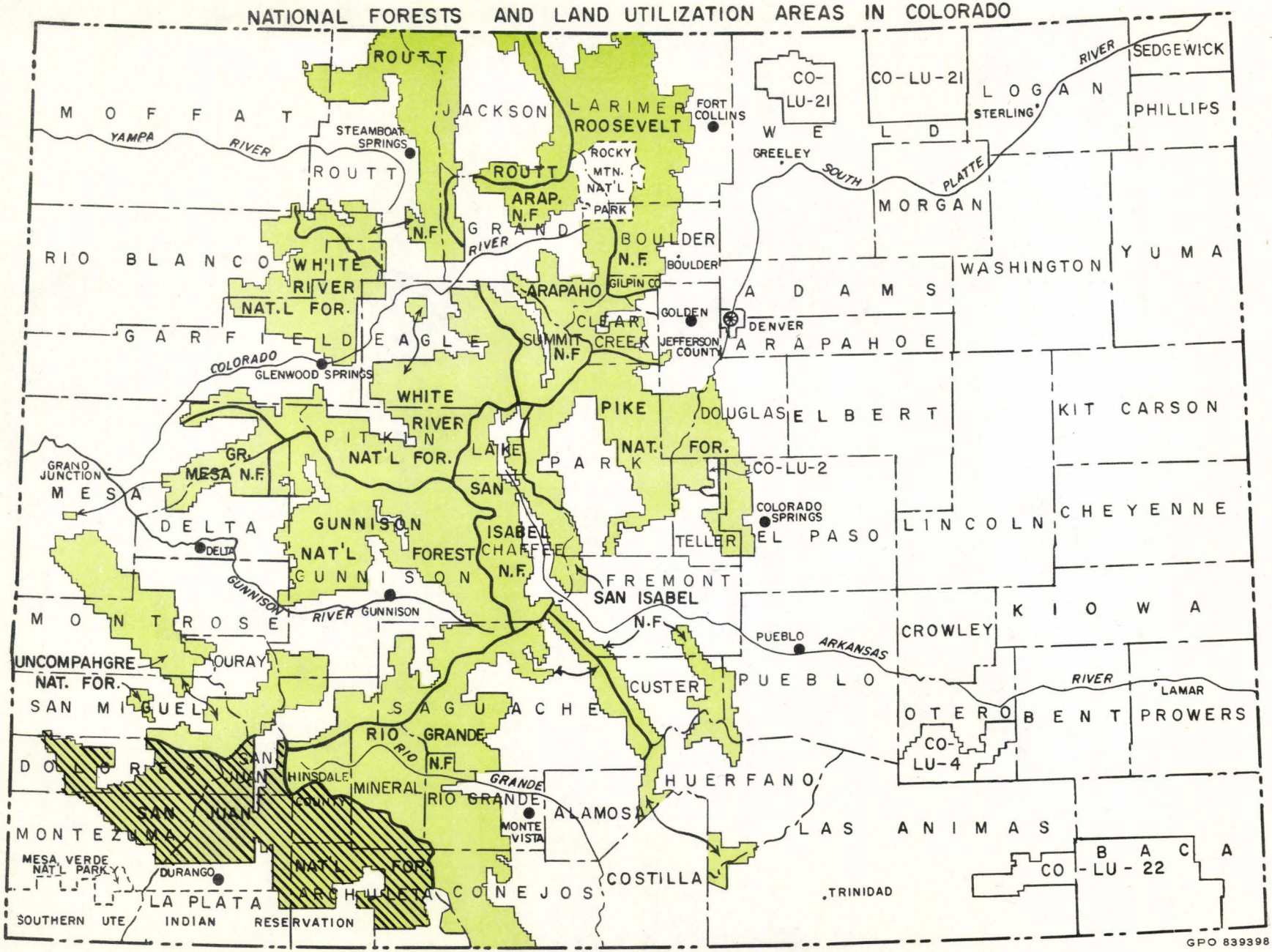
NATIONAL FORESTS AND LAND UTILIZATION AREAS IN COLORADO



SAN JUAN NATIONAL FOREST and WORKING CIRCLE

GPO 839398

INTRODUCTION

Timber is a crop -- a yield of wood from timber-producing lands. Its growth and yield are reckoned in terms of decades or a century, in contrast to annual yields of crops from agricultural lands, and yet the end results are essentially the same if by proper manipulation the forest can be made to yield successive annual crops of timber to satisfy human needs. This process of manipulation -- timber management -- evolves from the attainment of long-range objectives for regulating timber growth and harvest and protecting the forest from damage.

The General Management Statement is one of three parts of the timber management plan for the San Juan National Forest. Its principal purpose is to state the broad objectives for management of the timber resources and to present the policies under which these objectives are to be met. It also contains essential background information such as the history of timber management, the inter-relationship with adjacent commercial forest lands, and other descriptive material to substantiate the overall objectives set forth.

The working circle plan, as the second part of the overall timber management plan, brings the general objectives and broad policy of the general statement more closely into focus for each 10-year period. The working circle plan thus contains the more immediate objectives and programs, such as the 10-year cutting budget, road and right-of-way needs, calculation of the allowable annual cut, reforestation and timber stand improvement programs, and a discussion of specific multiple-use considerations and protection needs.

Part three of the forest's timber management plan is the timber management record. It is subdivided into eight block records, each of which is prepared and maintained at the ranger district level. The block record consists of atlas-size record sheets and maps for the individual compartments within the block, upon which are posted the periodic changes in timber areas and volumes, annual disposal data, stand improvement work, reforestation, and protection measures undertaken. The timber management record forms the basis for detailed planning and accomplishment compartment-wise, within the broader framework of the working circle plan.

MANAGEMENT OBJECTIVES

Management of the timber resource on the San Juan National Forest will be directed towards developing the commercial timber area to its sustained yield capacity. All commercial forest lands will be put into an acceptable growing condition by the year 2000 A.D. At the present time mortality due to insect epidemics exceeds growth in the sawtimber stands, and the net growth in poletimber stands is negligible.

The average annual sawtimber allowable cut objective for the Rocky Mountain Region by the year 2000 A.D., as given in the Timber Resource Review (1958), is 150 board feet per acre of commercial forest land. The current regional average annual allowable cut for sawtimber is 43 board feet per acre of commercial forest land. The past average annual allowable cut of sawtimber for the San Juan National Forest was 49 board feet per acre of commercial forest land.

To meet the objectives as stated in the Timber Resource Review, the productivity of the land must be tripled during the next 40 years. This will be done by taking the following action.

1. ATTAIN A BALANCED DISTRIBUTION OF AGE CLASSES WHICH WILL MAXIMIZE THE SUSTAINED FOREST YIELD AND MINIMIZE SURPLUSES OF FOREST CAPITAL ON WHICH INCREMENT HAS CEASED.

   This objective pertains to regulation of the cut within the four working groups of spruce-fir, aspen, ponderosa pine, and Douglas-fir--white fir types. Basic essentials to attainment include the following:

   a. Harvest all overmatured timber within the next 40 years. The allowable cut will be reviewed and recalculated at least every 10 years. The length of the adjustment period for overmature stands may be revised at that time, if there is any material change in mortality.

   b. On the basis of inventory data, schedule the cutting of overmatured timber to attain a balanced distribution of age classes in the shortest practicable time.

2. ESTABLISH AND MAINTAIN GROWING STOCK FOR OPTIMUM ULTIMATE YIELDS OF MATURE TIMBER FROM EACH USABLE ACRE, SUBJECT TO ESTABLISHED PRINCIPLES OF MULTIPLE RESOURCE USE.

   The goal is full scale production of high quality wood on all commercial forest land in harmony with other resource use as prescribed by the Multiple-Use Plan for the Western Colorado Subregion. Attainment will be through sustained programs of reforestation and stand improvement, as well as protective measures to reduce damage or loss from fire, insects, diseases, and harmful rodents and other animals.

Harvest cuts will normally be deferred until stands reach maturity, under the principle that public lands are best suited for producing large timber to satisfy future public needs. Under this objective, the following action will be taken:

a. Loss by fire will be kept within the "burned area objective" for commercial timberlands as expressed in the fire prevention plan for the forest.

b. Insect infestations will be kept within an endemic level, with particular emphasis on preventing the explosive build-up of Engelmann spruce and Black Hills bark beetles.

c. Infections of dwarfmistletoe in ponderosa pine stands will be controlled by proper cutting and timber stand improvement practices.

d. Populations of porcupines and other destructive animals will be controlled to reduce damage to growing stock.

e. Reforest all nonstocked commercial forest land, including old burns, within the next 20 years. Assure through regeneration measures, adequate stocking on ponderosa pine and spruce-fir cutover areas within three years after cutting.

3. DEVELOP MARKETS AND ATTRACT INDUSTRY WHICH WILL UTILIZE THE FULL ALLOWABLE CUT OF ALL TIMBER YIELD, INCLUDING THE YIELD FROM INTERMEDIATE CUTTINGS.

This will be accomplished by FY 1972 through an active program of salesmanship to promote industrial development commensurate with the available supply of wood.

The maintenance of a stable industry will be encouraged by annually offering for sale a volume of timber equalling, as near as practicable, the annual allowable cut.

Transportation system development will be patterned to facilitate orderly attainment of the allowable cut.

4. COORDINATE TO THE EXTENT PRACTICABLE WITH TIMBER MANAGEMENT OBJECTIVES AND PROGRAMS ON ADJACENT COMMERCIAL FOREST LANDS. ENCOURAGE GOOD TIMBER MANAGEMENT PRACTICES ON ALL FOREST LANDS, REGARDLESS OF OWNERSHIP.

The area of commercial forest land adjacent to the San Juan Forest is of sufficient magnitude to influence dependent forest industries, the direction depending upon the quality of management applied to such lands. The total timber yield from all lands, public and private, holds real promise for a larger and more diversified forest products industry within the San Juan Basin area.

LAND DESCRIPTION

Location

The gross area of the San Juan National Forest is 2,080,167 acres. It is located on the western slope of the Continental Divide in southwestern Colorado, in Mineral, Archuleta, Hinsdale, La Plata, San Juan, Dolores, and Montezuma Counties. The Continental Divide forms the east and northeast boundaries. The divide of the San Miguel forms the northern boundary. The south and west lines are bounded by privately owned range and agricultural lands at lower elevations.

Subdivisions

The entire forest constitutes a single unit known as the San Juan Working Circle. The working circle contains eight blocks the boundaries of which correspond to ranger district boundaries and are designated as follows:

Animas	Glade	Piedra
Columbine	Mancos	Pine
Dolores	Pagosa	

The working circle is further divided into 196 compartments, six of which contain, in their entirety, about 250,000 acres of lands withdrawn for wilderness, wild, and natural areas. The remaining compartments each contain an average of about 6,400 acres of commercial forest land, with individual areas ranging from 2000 to as much as 38,000 acres, depending upon topography and forest stand conditions.

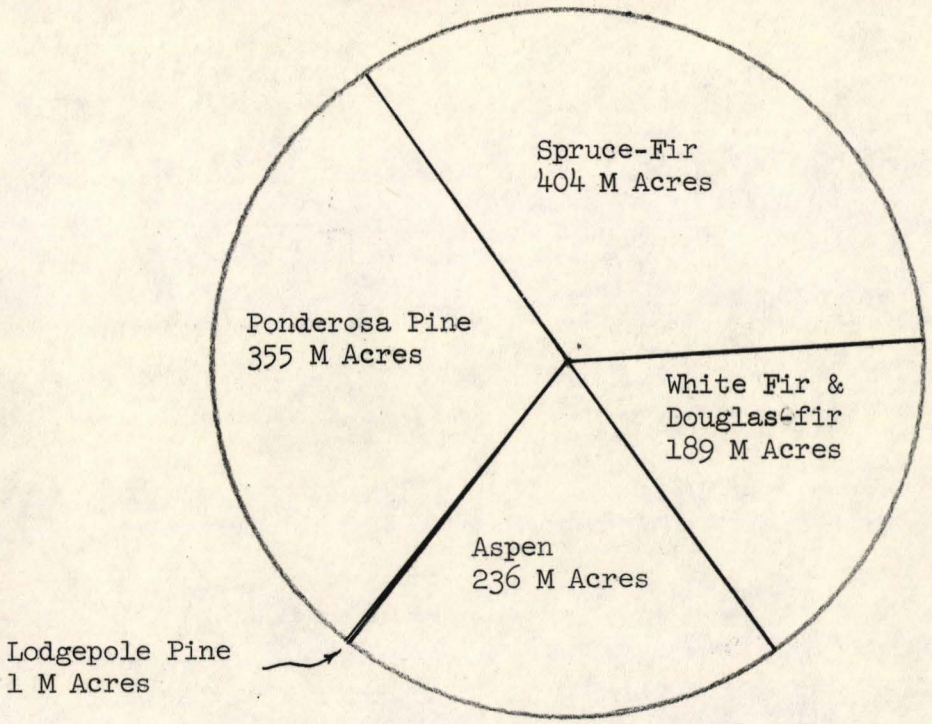
Table 1

Area by Blocks, Ownership and Commercial Forest Land

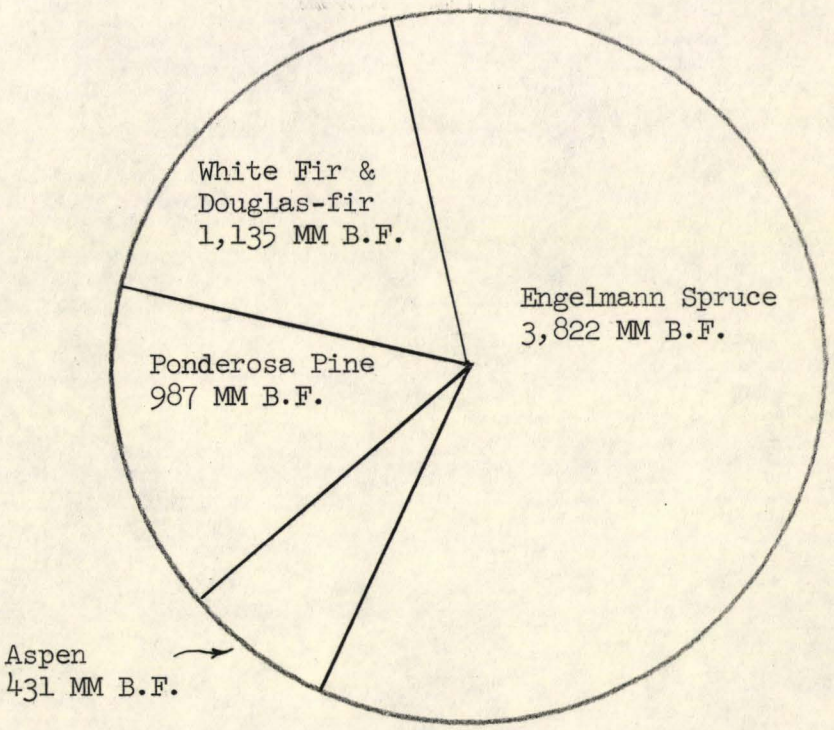
Thousand Acres

Blocks No.	Blocks Name	Total Area Gross	Total Area Net National Forest	Total Area Net Alienated	Acres of Commercial Forest Land National Forest	Other Federal	State, County, Etc.	Private	Total
1	Glade	255	243	12	137	-	-	3	140
2	Dolores	249	235	14	187	-	-	9	196
3	Mancos	135	122	13	102	-	1	7	110
4	Columbine	252	233	19	126	-	-	9	135
5	Animas	211	187	24	152	-	1	10	163
6	Pine	229	201	28	74	-	-	13	87
7	Piedra	364	310	54	221	2	1	20	244
8	Pagosa	385	313	72	188	-	-	38	226
	TOTAL	2,080	1,844	236	1,187	2	3	109	1,301

COMMERCIAL FOREST ACREAGE BY TIMBER TYPES



ESTIMATED SAWTIMBER VOLUME BY SPECIES



Relation to Other Forest Lands

Because of the topography, interrelations with adjacent national forests are limited. There is, however, an important relationship with adjacent commercial timberlands in the San Juan Basin area owned or administered by other agencies or by individuals. This relationship is illustrated by the map on Page 9. The area of commercial forest land in other ownerships within the San Juan Basin's zone of influence is estimated as follows:

Inside San Juan National Forest	Commercial Forest Area - (Acres)
Private ownership	109,000
State of Colorado	2,000
Other Federal	2,000
Total inside N. F.	113,000 Acres

Outside San Juan National Forest	
Private ownership, Colorado	300,000
Private ownership, New Mexico	100,000
State of Colorado	6,000
State of New Mexico	2,000
Bureau of Land Management, Colorado	65,000
Bureau of Land Management, New Mexico	20,000
Carson National Forest (New Mexico)	50,000
Southern Ute Indian Reservation, Colorado-	75,000
Jicarilla Apache Indian Reservation, New Mexico	150,000
Total outside N. F.	768,000 Acres
Grand Total, other interrelated commercial forest lands	881,000 Acres

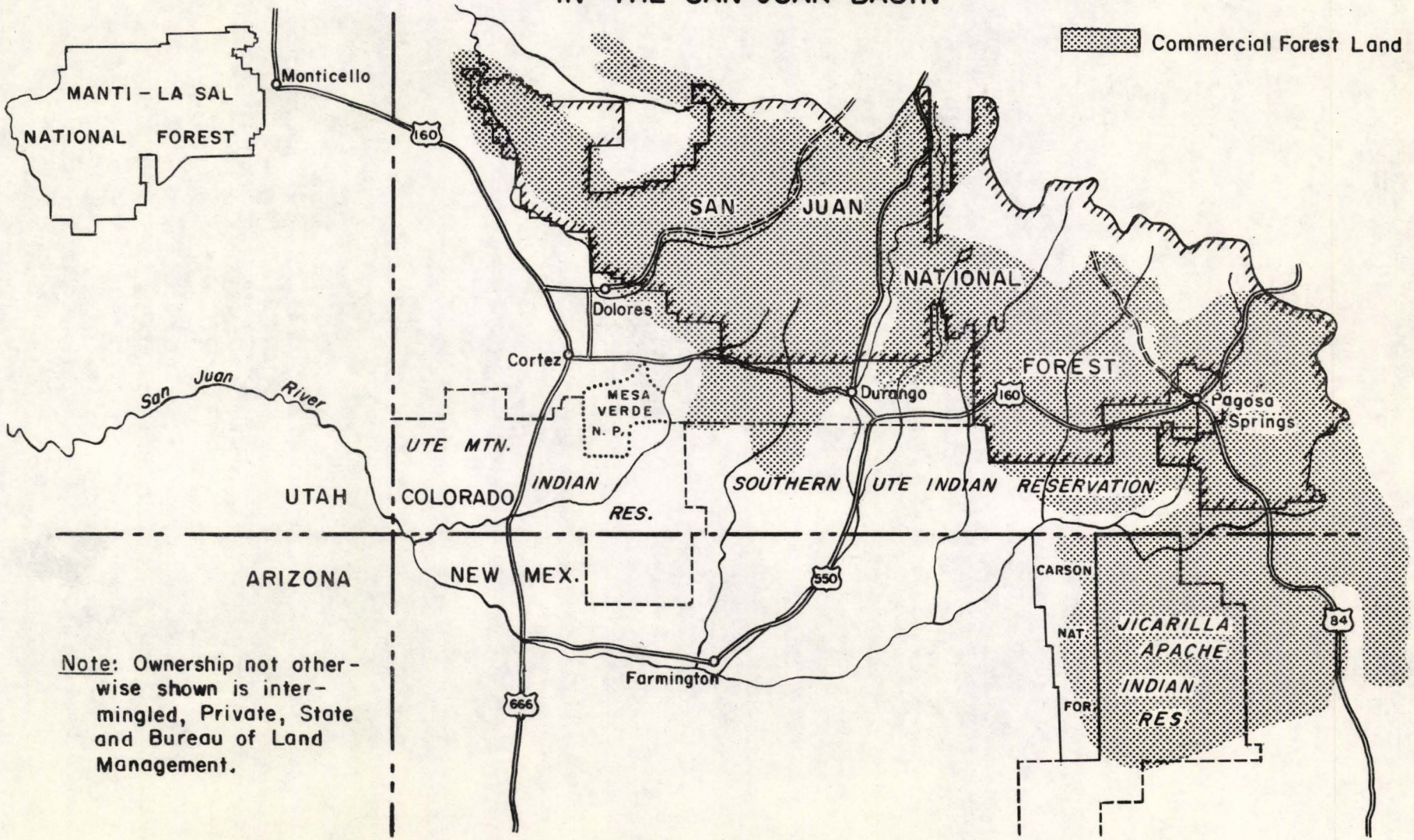
These interrelated commercial forest lands are primarily in the ponderosa pine type. Stocking usually is fair to poor, with many thousands of acres nonstocked due to early logging and to grazing and fires. Federally administered lands still, however, contain substantial sawtimber stands.

Little or no control by the owner is exercised over cutting on State and private lands and hence essentially no forest management is practiced. In general, the private lands are considered as grazing lands by their owners and, with but few exceptions, their value as timber-producing lands is not recognized. This is unfortunate because these lands usually have a higher potential for

timber production than for forage production. Since it is practicable to maintain a satisfactorily-stocked stand of ponderosa pine and continue forage production and moderate use, a potential source of community support lies undeveloped.

Viewed broadly, it is desirable that these understocked or denuded areas of private land be put back into timber production. The supplemental yield from these adjacent lands will make the difference between a modest forest industry dependent on national forest timber alone, and a larger-scale, diversified forest products industry drawing its raw material from the whole area of commercial forest land in the San Juan Basin. This need for coordinated timber production from all forest lands is considered of sufficient importance to warrant including it as a major objective of management.

SHOWING COMMERCIAL FOREST LAND AND OWNERSHIP PATTERN IN THE SAN JUAN BASIN



Note: Ownership not otherwise shown is intermingled, Private, State and Bureau of Land Management.

GPO 842859

STAND CONDITION

The commercial forest land on the San Juan National Forest is classified into four major forest types. Approximately 31% of the area is in the ponderosa pine type and occurs at the lower altitudinal range of commercial timber species. Another 32% of the area supports the spruce-fir type at elevations above 9,500 feet. In between these two altitudinal zones there occur various combinations of mixed forest types which for management purposes are classified as either Douglas-fir--white fir or as aspen, depending on stand composition. The area by timber types, stand sizes, and stocking classes is shown in Table 2 on Page 16.

Spruce-Fir Type

This type occurs at elevations ranging from 9,500 feet to 11,500 feet. Ths predominant tree species is Engelmann spruce (Picea engelmanni) which comprises from 75% to 95% of the total volume in mature stands. Corkbark fir (Abies Lasiocarpa var. arizonica) is its most common associated species. At lower altitudinal limits, Douglas-fir (Pseudotsuga menziesii) and aspen (Populus tremuloides) also occur as associated species with the spruce. Several thousand acres of aspen overstory are undergrown with seedling, sapling and pole stands of immature spruce-fir which will eventually convert to the spruce-fir type.

The 1959 forest inventory determined the total area of spruce-fir type as 404,000 acres, 90% of which support sawtimber size stands. In fact, the spruce-fir type accounts for 60% of the present sawtimber volume on the San Juan National Forest. The age of the sawtimber stands varies from 80 to 300 years, with an average of 170 years. This is based on increment borings taken of 101 randomly-selected trees by the Forest Survey in 1959. The net sawtimber volume in these stands averages about 17.5 M B.F. per acre over large areas with individual stands varying from 13 M B.F. to as much as 35 M B.F. per acre. Basal area averages between 160 and 180 square feet per acre. The gross growth rate under wild conditions has averaged approximately 55 bd. ft. per acre per year. Under management this rate should increase to 150 or 200 bd. ft. per acre per year. The current average annual mortality in the sawtimber type is approximately 12 cubic feet. The mortality in trees 11.0" d.b.h. and larger exceeds the gross growth. This mortality is due largely to insects.

In the younger classes 23,000 acres were classified as pole stands, 4,000 acres as seedlings and saplings, and 8,000 acres as nonstocked. The nonstocked lands are mostly those areas clear cut during the period 1952-1958 where natural regeneration has not taken place.

The above indicates that an unbalanced distribution of age-classes exists in the spruce-fir type.

Some advance reproduction of spruce and fir is usually present in older stands which have begun to break up, but natural reproduction is very slow to come in after logging. Numerous old burns are still nonstocked after 60 to 80 years. This deficiency makes it necessary to prescribe artificial regeneration measures in the spruce-fir type following the harvest cut.

The spruce bark beetle (Dendroctonus engelmanni), is a serious and persistent threat to spruce sawtimber stands. Epidemic infestations have recently occurred in the Dolores, Mancos, and Animas blocks during the period 1952 - 1959 involving some 75,000 M B.F. which was later salvage-logged. Future outbreaks can be expected to occur as long as the spruce stands remain predominantly mature and overmature.

Butt rot is the most significant disease in the spruce-fir type, causing as much as 25% defect in overmature and decadent stands. The "witch's broom" rust (Peridermium sp.) is another important disease which usually results in top rot and top breakage in overmature timber, especially on the more severe sites.

Engelmann spruce is shallow rooted and subject to severe and often total damage by windthrow. This factor alone necessitates even-aged silviculture, with clearcuts at rotation age. Past attempts at partial or selection cuttings have not been successful, except for removal cuttings in two-aged stands where the thrifty understory was left virtually untouched.

Ponderosa Pine Type

This type occurs in a broad belt extending across the southern portion of the San Juan National Forest at elevations from 6,500 to 8,500 feet. It occurs in pure stands within its lower and middle altitudinal range. The degree of stocking is at an optimum in its middle range on shallow, sandy soils. On north-facing slopes, Douglas-fir is a common associate, occasionally replacing the pine altogether. Toward the upper limits of the pine belt other species such as white fir (Abies concolor), aspen, and Douglas-fir become more prevalent.

The preliminary figures for the 1959 forest inventory indicated the total area of ponderosa pine type at 355,000 acres, 85% of which is classed as sawtimber. Most of this area has been cut over at least once during the past 60 years. In general, the present degree of stocking is not good, since 44% of the total pine area is classified as poorly stocked or nonstocked. Large areas have been taken over by oakbrush.

The stands consist generally of a myriad of small, even-aged groups of trees. Stand density varies from a few scattered trees to fully stocked stands of 20 M B.F. or more per acre.

The mature timber in stands free of dwarfmistletoe will be removed in a series of cuttings at intervals of approximately 20 years using the shelterwood silvicultural system. Clear cutting will be applied to stands infected with dwarfmistletoe. The size of the clear-cut patches will depend upon the extent of the infection.

Due to understocked conditions, the average growth rate for the pine type as a whole is less than five cubic feet per acre per year. However, the growth potential on medium and good sites is amazing for this geographical area, attaining as much as 300 bd. ft. per acre per year on vigorous, fully stocked stands. Under management, an average increment of 150 bd. ft. per acre per year should be easily attainable.

The most serious insect pest is the Black Hills bark beetle (Dendroctonus ponderosae) which causes heavy mortality in overmature stands. Continuing control measures are needed to prevent populations of this pest from becoming epidemic. The engraver beetle (Ips sp.) occasionally destroys small groups of young trees immediately after logging, and often kills older trees which have been weakened by lightning strikes or dwarfmistletoe. Dwarfmistletoe is present in patches throughout much of the lower altitudinal range of pine.

Red ray rot (Polyporus anceps) is common in mature and overmature trees. It accounts for most of the loss due to wood rotting fungi, amounting to an average of 15% in old timber.

Natural reproduction of ponderosa pine is very difficult to establish. This is believed due to the regular occurrence of drought conditions during the month of June when seedlings have just germinated. Also, the young seedlings are palatable to deer, rabbits, porcupines and mice and are subject to damage from livestock trampling. Several grass and brush species compete with the pines for growing space, with pine usually losing out in the struggle for survival. Faced with these obstacles, the pine manages to establish extensive stands of reproduction only about every 20 to 40 years when conditions happen to be favorable. This is too long a period to wait for regeneration. Under management it is necessary, therefore, to supplement with planted stock after logging.

Douglas-fir--White Fir Type

At elevations from 8,500 to 9,500 feet, the pine gives way to a mixed conifer type whose principal components are white fir and Douglas-fir. Numerous other species occur in this type, including ponderosa pine at lower altitudes and Engelmann spruce and corkbark fir at higher altitudes. Aspen is usually well represented

in the Douglas-fir--white fir stands. Occasionally Douglas-fir occurs in pure stands, especially on steep northerly exposures, but there is usually a mixture of several species. The sites occupied by this type are potentially the most productive on the forest as is evidenced by the large size of the Douglas-fir, spruce and aspen trees found there. The soils are relatively deep and fertile, and the terrain is generally characterized by numerous benches alternating with short, steep slopes in a stair-step fashion. Spruce and Douglas-fir trees 40 to 50 inches D.B.H. with a merchantable height up to 100 feet are not uncommon on the better sites.

The total area of Douglas-fir--white fir type is 188,000 acres practically all of which is in sawtimber sizes. Generally the stands are composed of numerous, even-aged tree groups or clumps. The stands are fairly dense, averaging from 10 to 20 M B.F. per acre in sawtimber. Occasionally, small areas will support as high as 50 M B.F. per acre.

Heavy mortality caused by spruce budworm and bark beetle attacks in over-mature trees often results in a negative growth rate in mature stands. In young, thrifty stands the rate of growth is outstanding, due to the favorable combination of deep soils and adequate precipitation. A growth rate of 200 bd. ft. per acre per year should be attainable under proper management.

The Douglas-fir bark beetle (Dendroctonus pseudotsugae) is a constant threat to overmature Douglas-fir. In the past decade the loss from bark beetles has been heavy, and continuation of such losses can be expected until the overmature component of these stands has been removed.

White fir is subject to heart rot, and the tree deteriorates rapidly after reaching maturity.

Spruce budworm is currently epidemic in white fir and Douglas-fir, and damage is now spreading to Engelmann spruce at the lower limits of this tree's range.

Most of the species in this type have the ability to regenerate themselves under the shade of the mature overstory. Advanced young growth of seed-lings, saplings, poles, and small thrifty sawtimber trees is common. The silvicultural practice favored is the group selection system, where repetitive partial cutting is applied. Clear cutting in small patches may also be used, but there is a tendency in this area for aspen to take over whenever the stand is opened. Although conifers will eventually crowd out the aspen in such a case, the benefits from obtaining prompt regeneration of conifers may be lost. Artificial regeneration of Douglas-fir or ponderosa pine will occasionally be necessary to maintain satisfactory stand composition after logging.

Aspen Type

The aspen type occurs at elevations from 8,500 to 10,000 feet, occupying essentially the same altitudinal zone as the Douglas-fir--white fir type and infringing upon the lower limits of the spruce zone. The total area within this type is 236,000 acres, 25% of which is in sawtimber, 68% in pole stands and 7% in seedling and sapling stands.

The aspen type is believed to have become established as a result of repeated burns which eventually eliminated the conifers that normally would occupy these sites as the climax forest type. The aspen attains its best development at elevations above 9,000 feet and often occurs in mixture with spruce and firs above 9,500 feet. Aspen stands are rather extensive on all blocks except the Glade and commonly occupy mesa lands immediately below the spruce zone.

Aspen stands are even-aged in character, except that overmature sawtimber stands often carry a rather well stocked understory of pole size timber thus making up a two-storied stand. This is an unusual characteristic of aspen peculiar to southwestern Colorado. The average age of sawtimber stands is approximately 120 years, while the pole stands vary from 40 to 80 years in age. All age classes are generally well stocked.

It is estimated that one-half the aspen area is on sites capable of growing small sawtimber within a rotation period of 90 years. Growth rate on these sites will average 100 bd. ft. per acre per year, yielding approximately 9 M B.F. per acre at maturity. The remaining one-half the area is estimated to be on sites from which we can expect only a pole or pulpwood yield. The current average annual net growth is approximately six cubic feet per acre. This is due to heavy mortality in the overaged sawtimber type.

Wood rotting fungi, frequently entering the tree through dead branches, fire scars, and other injuries cause significant losses in aspen over 100 years old. The fungi occurring most frequently and causing the greatest amounts of decay are, in order of importance, Fomes igniarius, Cryptochaete polygonia, Collybia velutypes, Fomes applanatus, and Pholiota squarosa. These wood decays should not, however, be serious factors in managed stands that are cut within the rotation age.

In young stands, cankers are more serious than wood decays. Cankers, important in causing death and cull in aspen, are black canker (cause unknown), sooty bark canker (Cenangium singulare), and hypoxylon canker (Hypoxylon prunatum).

Several kinds of borers and other insects attack the aspen, but their populations have been endemic only. The Great Basin tent caterpillar (Malacosoma fragile) becomes epidemic occasionally. No large losses have, however, been experienced from this defoliator.

Aspen reproduces by sprouts and by suckers. This new growth comes in profusely following logging to assure rapid regeneration of harvested areas. Sucker and sprout growth is subject to severe browse damage on sheep ranges, and it is necessary to defer grazing for a minimum of three years after logging to give the young sprouts a chance for survival.

Table 2

Area By Types, Stand Size Classes and Stocking Classes

Commercial National Forest Unreserved Land — Acres

Types	Large Sawtimber				Small Sawtimber				Poletimber				Seedling-Saplings				Non-stocked	Total
	Well	Med.	Poor	Total	Well	Med.	Poor	Total	Well	Med.	Poor	Total	Well	Med.	Poor	Total		
Douglas-fir		63,434	31,595	95,029	270	27,134	59,482	86,886	1,580	3,374	970	5,924	-	10	-	10	970	188,819
Ponderosa Pine	40	24,256	81,361	105,657	-	9,077	187,602	196,679	2,775	7,625	16,370	26,770	-	190	75	265	25,269	354,640
Lodgepole Pine				0				0	30	10	10	50	290	790	-	1,080	0	1,130
Spruce-Fir	11,032	118,089	40,359	169,480	5,847	87,540	107,063	200,450	5,173	8,635	8,867	22,675	300	2,730	730	3,760	8,103	404,468
Total				370,166				484,015				55,419				5,115	34,342	949,057
Dead Spruce																		130
Total Conifers																		949,187
Aspen				537				58,155				160,339				17,009	430	236,470
Other Hardwoods				0				1,305				105				0	0	1,410
Total Hardwoods				537				59,460				160,444				17,009	430	237,880
Grand Total				370,703				543,475				215,863				22,124	34,772	1,187,067

GPO 849691

SUMMARY OF RESULTS UNDER PREVIOUS PLANS

Prior to 1956 there were seven working circles on the forest, as indicated in Table 3 on page 18. The objectives of previous management plans for these working circles were to produce maximum continuous yields of sawtimber and other forest products and to remove the allowable cut. The actual cut has in practically all cases fallen well below the allowable cut during the past 45 years. Most of the early cutting was, however, in the ponderosa pine type, but with the development of a steady market for spruce lumber the total cut for the forest has been increasing, as indicated below.

Period	Total Cut - M B.F.
1920 - 1929	99,028
1930 - 1939	88,519
1940 - 1949	153,366
1950 - 1959	328,658

The ponderosa pine type on the Dolores Working Circle was heavily cut during the period 1925 to 1950. A series of large sales of ponderosa pine were made with the express purpose of removing all the mature and overmature timber of this species in the working circle. It was realized that after this material was removed, the allowable cut would drop sharply.

A spruce bark beetle epidemic beginning in 1953 on the Rico Working Circle resulted in the salvage cutting of approximately 60 MM B.F. of spruce timber.

A major revision of the original management plans was made effective on July 1, 1956, when the seven original working circles were tentatively consolidated into three to bring them into line with the then current pattern of log transportation and sawmilling. The tentative annual allowable cut for these three working circles, based on the best available inventory data was set at 50 MM B.F. The development of still larger mills, better transportation systems, and more efficient hauling and logging equipment, now makes it practicable to manage the timber resources of the San Juan National Forest as a single working circle.

Table 3 - Results Under Previous Plans

PERIOD 1/1/42 - 6/30/56

W.C.	Date Plan Approved	Net Comm. Area M Acres	Est. Sawtimber Volume (MMBF)	Annual Allowable Cut (MBF)	Total Actual Cut (MBF)	Cumulative Total Allowable Cut (MBF)	Cumulative Difference Between Allowable & Actual Cut (MBF) Surplus	Deficit
Pagosa	3/6/25 (Rev.3/28/42)	224	1,124	10,000	27,249	145,000	117,751	
Piedra	9/17/34	111	992	17,364	61,918	251,778	189,860	
Animas	-	146	458	6,100	57,542	88,450	30,908	
Pine River	7/10/41	69	224	2,685	20,034	38,932	18,898	
Dolores	2/10/42	133	228	11,300*	64,208	119,700	55,492	
				1,901**	49,204	49,555	351	
Dove Cr.	5/18/42	5	7	228*	1,410	2,052	642	
				0**	1,160	0		1,160
Rico (No plan prepared)		97	503	-	22,394	(22,394)	-	
Forest Totals 1942 to 1956		785	3,595		305,119	717,861	412,742	-

* 1942-1950
** 1951-6/30/56

PERIOD 7/1/56 - 6/30/59

Pagosa Spg.	2/3/57	282	1,612	19,600	26,015	58,800	32,785	
Durango	2/3/57	281	1,165	13,000	36,606	39,000	2,394	
Dolores	2/3/57	365	1,527	17,400	64,227	52,200		12,027
Forest Totals 7/1/56-6/30/59		928	4,304	50,000	126,848	150,000	23,152	

SILVICULTURAL SYSTEMS

Results from Past Systems

The silvicultural system applied in past years to the ponderosa pine type consisted of heavy harvest cuttings. The effect of this system was to remove practically all the old "yellow pine" component, except for occasional seed trees left in understocked and nonreproducing areas. Starting about 1940 a more conservative marking policy was applied to provide for a residual sawtimber overstory of thrifty mature and younger trees of good form.

Wherever advanced young growth was present in the original stand, it grew vigorously after logging and is now excellent second growth timber. A rather large acreage of old cutover stands did not, however, contain advanced reproduction. These areas are still poorly stocked and oakbrush is increasing. Natural reproduction following logging has generally been poor, although it has been somewhat better on the Glade Block than on other areas.

On the basis of past experience, two conclusions can be drawn to improve future silviculture in ponderosa pine. First, cuttings should be lighter and should recur at approximately 20-year intervals so as to maintain heavier stocking which will subdue brush and increase seed production. Second, areas which are unsatisfactorily stocked at the time of cutting should be planted immediately after logging and before invading vegetation can impair the site.

In the spruce-fir type, the silvicultural system applied was in the nature of a partial cut, removing just the larger overmature trees and not to exceed 40% of the stand volume. The system worked satisfactorily in stands which were primarily thrifty and with just the right proportion of scattered old-growth trees. In attempting to apply this system to mature and overmature stands, however, the residual stands suffered severe loss from windthrow and bark beetle attacks.

Starting in 1946, a system of clear cutting in strips was employed. Clear-cut strips 200 feet wide were designated between alternate 300-foot reserved strips. The system proved unsuccessful. It was difficult to adapt to variations in terrain and timber condition, and it created an excessive amount of cutting edge, or periphery, subject to windthrow and subsequent increase in bark beetle populations. It was found that natural reproduction was very slow to become established, even in the narrow clear-cut strips, and that spruce bark beetle populations rapidly built up to epidemic proportions in the logging slash and then moved out to attack adjacent standing timber. Clear-cut areas were also rapidly taken over by competing vegetation which in turn induced use and trampling by livestock.

Experience in harvesting spruce points toward the following conclusions:

1. Clear-cut sizeable blocks which are laid out to fit timber condition and to create a minimum distance of edge or periphery.

2. Bunch and burn all slash to reduce the volume of host material subject to bark beetle attack and to prepare the site for planting.

3. Plant, to obtain a fully stocked stand, as soon as slash is disposed of and before competing vegetation becomes established.

4. On the drier spruce sites, or where site deterioration has occurred, use lodgepole pine planting stock.

In the mixed conifer type (Douglas-fir--white fir), marking rules were based on the needs of the predominant species in the type. Their application resulted in leaving a satisfactory residual stand of thrifty immature trees.

In aspen, the system has been a commercial clear-cut to a 10" diameter limit. Live cull trees were left standing, on the assumption that they would blow down or would die from insolation. This did not prove to be the case, however, and starting in 1959 the deadening of cull trees was prescribed as a stand improvement measure. It was found that residual trees of younger age in the understory responded well to release, and that they could be expected to yield high quality volume in subsequent removal cuttings.

Current Systems

The ponderosa pine and the Douglas-fir--white fir types will be managed for sawtimber production as all-aged aggregates of small, even-aged groups of trees. Theoretically, the basic system of silviculture will be to clear cut, at rotation age, applying the principle of unit control to tree groups. It will consist of a combination improvement-harvest cutting applied at the 20-year intervals to each compartment or cutting unit, as scheduled in the cutting budget, and followed by artificial or natural regeneration of openings vacated by mature tree groups. Stands that are heavily infected with dwarfmistletoe will be clear cut at rotation age and planted within one year after the harvest.

The spruce-fir type will be managed for sawtimber production as an aggregate of even-aged stands of separate age groups, each to be clear cut at rotation age with the objective of even-aged management. Harvest cutting will normally be by patches 20 to 100 acres in size, with locations staggered as practicable to avoid large areas of a single age group which might impair watershed values. The size and shape of clear-cut areas should be controlled by conditions inherent to the site, the stand, and the silvics of the species. Regeneration will be by artificial means whenever necessary to establish new growth promptly following the harvest cut.

The aspen type will be managed as an aggregate of even-aged stands of separate age groups, each to be clear cut at rotation age. The objective will be even-age management to produce trees of small sawtimber size for specialty products, including veneer, core stock, and lumber. Harvest cutting will normally be by patches of variable size, with locations coordinated as practicable to minimize conflicts with other authorized land uses. The size and shape of clear-cut areas will be controlled by conditions inherent to the site, the stand, and the silvics of the species. Where conifers occur in mixture with the aspen, silvicultural practices will favor the conifers. Conversion of aspen to conifers by artificial means will normally be confined to areas which are poor sites for aspen.

Silvicultural practices applied to all types will conform to guidelines in the Region Two Timber Management Guides (FSH2-2442.8). Silviculture will be modified as necessary to preserve and enhance aesthetic values on sites reserved for roadside zones, waterfront zones, and recreation areas and their buffer strips.

TRANSPORTATION

The principal markets for forest products are in the Southwest, Middle West and the Central States. Railroad transportation from the San Juan National Forest is available, but with either a considerable truck haul to the railhead or the necessity of transferring from narrow to standard gauge lines. The Denver and Rio Grande Western Railroad operates a narrow gauge line from Durango to the San Luis Valley and a standard gauge line east from the Valley to junctions with other trunk lines and to Denver. This standard gauge line can also be reached in the San Luis Valley at South Fork, Colorado, a distance of 45 miles from sawmills at Pagosa Springs. The D&RGW Railroad's main line can be reached at Ridgway, Colorado, but only after a truck haul over Lizard Head or Red Mountain Pass.

The Santa Fe Railroad can be reached at Gallup, New Mexico, 180 miles southwest of Durango or at Bernalillo, New Mexico, 200 miles southeast of Durango.

In general, railroad transportation facilities do not satisfactorily serve the purposes of the timber industry.

Highways

Highway U. S. 160 skirts the southwestern and southern boundaries of the forest and traverses the southeast portion. It serves as the principal link with transcontinental highways to the northeast. Highway U. S. 84 extends from Pagosa Springs southeast through Santa Fe and into Texas. Highways Colorado 145 and U.S. 550 cross Lizard Head and Red Mountain Passes, respectively, for access to transcontinental highways, or as mentioned above, to the railhead at Ridgway, Colorado. Highway U. S. 666 extends southward from Cortez to transcontinental Highway U. S. 66 at Gallup, New Mexico.

This basic system of highways is adequate for use of the timber industry but improvement in construction standard is needed. Considerable improvement has been made in recent years on Highway U. S. 160, but more is necessary on this and other highways, both Federal and State. A short cut route from Cortez through the Navajo Indian Reservation to Flagstaff is in the development stage. This highway can materially influence marketability of forest products in the Southern California area.

Forest Development Roads

The present forest development road system is inadequate to protect extensive overmature stands from devastation by large-scale insect epidemics such as the spruce bark beetle. All main line access roads to inaccessible bodies of overmature timber will receive high priority in planning and in their scheduled construction.

The status of road construction and road needs is shown in Table 4.

Table 4

SUMMARY OF THE SAN JUAN NATIONAL FOREST
DEVELOPMENT TRANSPORTATION PLAN AS OF JUNE 30, 1960

Primary Forest Value	Miles			
	Existing	Additional Needs	Total	Currently Planned
Timber	541.9	4,499.0	5,040.9	557.6
Adm. & Fire	256.1	1,820.9	2,077.0	21.3
Other Resources	181.7	30.8	212.5	29.0
Total	979.7	6,350.7	7,330.4	607.9

Construction of timber access roads will be by either the purchaser or the Forest Service. Generally, timber access roads will be designed for multiple-use needs; and, if purchaser-built, the costs for construction standards above those required to remove the timber will be borne by the Forest Service rather than by the purchaser of the timber.

Forest Service construction or participation in construction will be employed to the limit of available funds and in accordance with the following priorities:

1. To provide access to large bodies of high-risk overmature timber upon which established industry is dependent and which might otherwise be destroyed by insects or other natural causes.

2. To supplement purchaser construction where, because of multiple-use considerations, road design standards and construction costs are clearly above normal needs for timber harvest.

The working circle plan will schedule the roads needed for the removal of timber included in the cutting budget. Road planning and programming should adhere to the following guides:

1. Conduct sufficient reconnaissance prior to start of 10-year budget period to insure that schedules for road construction are realistic.

2. As a part of the presale prescription job, complete ground reconnaissance for each road location, including feasible alternate routes, at least two years in advance of sale.

3. For purchaser-built roads, complete the engineering location survey work for each road at least one year in advance of sale and at least two years in advance for Federally financed roads. Secure necessary right-of-way for all roads at least one year in advance of sale.

REFORESTATION

Ponderosa pine and Engelmann spruce do not regenerate themselves satisfactorily under natural conditions following logging. It is apparent that planting is necessary if the stand is to be regenerated within a reasonable time after logging.

Some factors which inhibit natural regeneration are:

1. The precipitation pattern for this area indicates a pronounced drought period during the month of June when seeds and seedlings are most in need of moisture.

2. Forest soils on spruce and pine sites are often deep and fertile, creating favorable conditions for brush, weeds, and grasses which compete with tree species for the limited available moisture.

3. Mouse and other rodent populations build up to epidemic proportions under the protective ground cover of brush and forbs and are especially destructive to ponderosa pine seeds and seedlings.

4. Deer, elk, rabbits, and squirrels all browse on ponderosa pine seedlings.

5. Livestock are attracted to new forage growth on recently cutover areas, and they impair tree regeneration by browsing, rubbing, trampling, and compacting the surface soil.

Research is critically needed to investigate and solve these regeneration problems.

Approximately 2,900 acres have been planted using appropriated funds. In recent years, an additional 1,870 acres were planted on cutover areas using sale-area-betterment cooperative funds. A continuing program of reforestation on cutover areas has been implemented amounting to about 2,000 acres per year. Appropriated funds will be needed to extend reforestation projects to nonstocked and poorly stocked areas where cooperative funds are not available to do planting. Direct seeding has been tried extensively, using ponderosa pine, lodgepole pine and Engelmann spruce seed. The results were unsuccessful, however, and no further direct seeding will be done until successful methods are developed through research.

Several lodgepole pine plantations totalling some 2,500 acres have been successfully established on the Lime Creek burn. One seeding project in 1911 on Coal Creek has yielded about 2,000 lodgepole pine trees showing good form and growth rate after 48 years. Although lodgepole pine is not native to the San Juan National Forest the growth and survival data from introduced stock is so encouraging that this species is now prescribed for planting on the drier, spruce clear-cut sites as a nurse crop to develop favorable seedbed conditions for spruce.

A planting schedule by compartments for the next 10-year period will be included in the working circle plan. Compartment descriptions on form R2-2400-19 when completed will list the reforestation needs.

TIMBER STAND IMPROVEMENT

Timber stand improvement work in past years has consisted mostly of pruning crop trees in the ponderosa pine type. Approximately 15,000 acres have been pruned since 1934, with most of the work performed as sale area betterment using cooperative funds. It consisted of pruning an average of 20 trees per acre to a height of 17 feet. Selected trees were of pole size, ranging from five to 10 inches in diameter and 40 to 60 years of age.

Two small, pilot thinnings were made during 1958 in young aspen coppice stands on the Mancos Block. The trees on one tract were six years old and on the other tract 12 years old. Results look promising, but it is too soon for proper evaluation. In general, there is little need for noncommercial thinnings in any forest types except aspen, since reproduction is seldom profuse. At present, thinnings in aspen cannot be justified except on the very best sites.

Very little work has been done on control of dwarfmistletoe in ponderosa pine. This job is now included in sale area betterment plans for accomplishment with cooperative funds.

Release work will be done on approximately 50,000 acres of medium and poorly stocked pine stands. Release will be accomplished by removing oakbrush and scrub aspen which is suppressing young pines. This job will be given high priority because it can reclaim extensive areas which otherwise may have to be reforested.

The program for timber stand improvement work to be accomplished within the 10-year budget period is contained in the working circle plan.

PROTECTION

Insects

The Engelmann spruce beetle (Dendroctonus engelmanni) is prevalent over the entire range of spruce on the San Juan National Forest. Infestations were noticed as early as 1910. Before 1950, localized epidemic infestations were observed in at least six areas widespread over the forest. These infestations were controlled through natural processes.

In June, 1950, a windstorm caused blowdown in the virgin spruce stands of the western portion of the San Juan Mountains. The center of the storm was near Dolores Peak. In 1952, the mature beetles emerged from the infested blowdown and in epidemic proportions attacked standing trees in the vicinity. This epidemic was controlled by chemically treating infested trees, supplemented by logging of infested material and treating cull chunks left in the woods. During this infestation about 60,000 M B.F. of spruce sawtimber was salvaged in nine timber operations.

Another windstorm in November, 1954, resulted in spruce bark beetle outbreaks on the Mancos and Animas Blocks. These concentrations were brought under control through chemical treatment supplemented by salvage-logging approximately 15,000 M B.F. of insect-infested spruce. There is at present a severe outbreak of Engelmann spruce bark beetle on the eastern portion of the forest. This outbreak resulted from a severe windstorm in the fall of 1956. In recognition of heavy current and potential losses of Engelmann spruce, an accelerated program of access road construction and timber disposal will be initiated. Present plans call for some 373 miles of primary access road construction and betterment to be completed within the next 10 years, and a stepped-up program of timber sales over the next 20-year period to remove approximately one billion board feet of timber from overmature and deteriorating spruce-fir stands.

The most destructive insect enemy of ponderosa pine is the Black Hills beetle (Dendroctonus ponderosae, Hopk.). Control measures against this insect pest date back to 1915. No large epidemics have occurred, but the accumulated loss over the years has been heavy, especially since the larger overmature trees are usually the ones attacked. A continuing maintenance and salvage program is applied to prevent epidemics and to salvage the loss in volume.

The Douglas-fir beetle (Dendroctonus pseudotsugae, Hopk.) has been very destructive during recent years and has caused the loss of a large portion of the commercial Douglas-fir sawtimber on the forest. No control measures have been undertaken, due to lack of technical knowledge of the insect and the inaccessibility of most of the stands.

Spruce budworm (Choristoneura fumiferana) infestations have increased rapidly over the past five-year period, attacking Douglas-fir, white fir and some of the Engelmann spruce. By 1960 the infestation has spread to some 250,000 acres and is in the epidemic stage. The budworm is destroying advance reproduction over large areas and is impairing tree growth throughout the Douglas-fir--white fir type. It has caused a serious setback in the production and sale of Christmas trees from the forest. Spruce budworm attacks are also rampant on adjacent forests in both Colorado and New Mexico, and large-scale control measures should be undertaken at an early date.

Disease

Very little work has been done in evaluating losses caused by forest tree diseases. Wood-rotting fungi are present in all overmature timber and are especially prevalent in aspen and white fir. This is a problem with which we must live until our old growth stands can be put under management.

Dwarfmistletoe (Arceuthobium vaginatum) on ponderosa pine is a problem in some localized areas. Stand improvement practices applied to control this disease after logging will be continued and expanded.

Animals

Porcupine damage in the ponderosa pine type is a continuing problem. A control program by forest personnel, Fish and Wildlife Service, forest users, and the general public will be maintained to keep the animals under control.

Deer, elk, cattle and sheep have an adverse effect on tree reproduction, particularly in the ponderosa pine zone. Browsing and trampling in small pine reproduction are believed to be contributing causes of scarcity of reproduction in this type.

Small rodents are also an important detriment to regeneration in this area. Damage is caused by girdling the reproduction as well as by reducing the amount of seed available for germination.

Fire

Potential loss from forest fires is illustrated by the following tabulation:

Table 5

PREVIOUS 10-YEAR FIRE FACTS
SAN JUAN NATIONAL FOREST

Calendar Year	Cause (Number of Fires)			Classes (Number of Fires)			Area Burned (Acres)
	Man	Lightning	Total	A&B	C & Up	Total	
1950	57	48	105	97	8	105	856
1951	42	52	94	89	5	94	1,224
1952	42	40	82	81	1	82	48
1953	11	37	48	45	3	48	412
1954	6	44	50	50	0	50	30
1955	38	26	64	61	3	64	285
1956	21	69	90	87	3	90	625
1957	5	25	30	30	0	30	3
1958	27	48	75	71	4	75	107
1959	23	82	105	103	2	105	127
Total	272	471	743	714	29	743	3,717
Average	27.2	47.1	74.3	71.4	2.9	74.3	371.7
Percent	36.6	63.4	100	96.1	3.9	100.0	-----

Fire occurrence is heaviest on the eastern portion of the forest, with the greatest intensity of lightning fires occurring on the Piedra Block.

Early forest fires in the 1800's were extensive and devastating. The following are some excerpts from the historical record:

1840 - 2,500 acres were burned near the present site of Rico.

1860 - 20,000 acres at the head of the Pine and Vallecito Rivers. These fires destroyed approximately 25,000 M B.F. of timber and were believed set by the Northern Utes to stop pursuit by the Southern Utes with whom they were at war.

1874 - 18,000 acres burned over between Rockwood and Silverton. Destroyed 450,000 M B.F. of timber.

1878 - A large body of spruce on Bear Creek was set afire by Indians. The burned area reverted to a dense stand of aspen.

1879 - 26,000 acres "Lime Creek Burn".

1892 - The Townsend Basin fire started along East Mancos Creek and burned to timberline.

1895 - 1,000 acres, Vallecito country.

1898 - 5,000 acres near Bayfield.

1898 - Near Mancos - fire burned from Horse Creek to Gold Run Creek and south to the Hogback.

1898 - West side of Middle Fork and Oak Brush Hill.

1900 - From the Piedra River up Sand and Weminuche Creeks between the Middle Fork and East Piedra Rivers.

1899 - 1905 - Several large fires occurred in the Douglas-fir--white fir and spruce types in the Pagosa country.

The historical record, as well as evidence on the ground, indicates that the Douglas-fir--white fir type was the most susceptible to devastating forest fires. Repeated uncontrolled fires appear to have resulted in large scale conversion to aspen stands. It is also apparent that the spruce type is quite inflammable under drought conditions, as evidenced by the Lime Creek and other high altitude burns.

Fire occurrence on the San Juan National Forest is more severe than on any other forest in the region except the Black Hills. It is important that fire control planning and staffing keep pace with logging operations.

LAND PROBLEMS

Right-of-Way

Rights-of-way will be needed in many cases, but no major problems in obtaining them are anticipated. The working circle plan will include a schedule for obtaining rights-of-way sufficiently in advance of road construction so that timber sales will not be delayed. The objective will be to obtain rights-of-way in and for the United States for all roads needed for use and development of the timber resources of the national forest. The Forest Service will not invest in roads on county-owned rights-of-way unless the pattern of settlement, or approved plans for future public highways, give reasonable assurance that the county will permanently retain them as public roads. The same principle will apply to rights-of-way obtained by the State.

Before action is taken to obtain rights-of-way, reference will be made to policies and procedures contained in FSM-FSH 5460.

Mining Claims

Mining activities have been concentrated in the areas above commercial timber stands or in the upper fringe of such stands. Under Public Law 167 of July 23, 1955, all claims, except a few isolated cases, have been processed for the determination of surface rights. It is anticipated that under these circumstances future conflicts between timber use and mining activity will be at a minimum.

Acquisition Program

There are within the forest boundary 236,615 acres of State and private land. Most of this is at the lower elevations in the bottoms and along major stream drainages. Most agricultural lands should remain in private ownership. There are, however, opportunities for acquisition of lands that would improve the administration or promote the development and use of the national forest resources.

The objectives for a land acquisition or exchange program are:

(1) To consolidate ownership where such action will facilitate administration.

(2) To acquire key areas to reduce right-of-way problems.

(3) To acquire potential commercial forest lands which, because of location or character, are best suited for public ownership.

There are no conflicts between the land acquisition plan and the timber management plan.

MULTIPLE-USE COORDINATION

The commercial forest lands in the San Juan National Forest lie within the "intermediate zone" as described in the land management plan. Management priorities in this zone are primarily for water and timber, with wildlife and grazing as secondary. Water-front and roadside zones and recreation sites and their buffer strips occur within the intermediate zone. In these areas, primary uses are for other than timber production. The Western Colorado Sub-region Land Management Plan provides the overall objectives, direction, and priorities for all zones. Land management block plans and the plans for specific resources will be consulted for more detailed policies and instructions. In addition to having detailed knowledge of the contents of the above-mentioned plans, the timber manager will also be guided by the policies in the Manual (FSM 2100) Multiple-Use Management.

Comments on coordination of timber management with other uses follow:

Water

Since the commercial forest lands are within the intermediate land management zone and share management priority with water, it is essential that all activities involving these resources be highly correlated.

In fringe areas adjacent to timberline, timber cutting will be secondary to water management. In other timber areas, preference will be given to timber management practices compatible with maintaining the water yield or to those which will tend to increase such yield.

Timber management practices on unstable soil will be modified to prevent accelerated soil movement.

Timber sale contracts will require the purchaser to repair erosion-causing damage resulting from road construction and logging operations. Logging slash and debris will be kept out of streambeds so as not to impede or contaminate the normal flow of water.

Recreation

Timber cutting in stands on existing recreation areas and on areas classified for future development and management for recreation purposes will be in accordance with instructions in the handbook (FSH 2413.22), in the multiple-use plan, and the recreation plan for the forest.

Grazing

Logging and other timber-use roads will be located so as to avoid natural parks and meadows where practicable. The use of natural openings to facilitate logging operations will be kept to a minimum commensurate with the comparative values involved. Upon completion of use, such areas will be promptly restored.

In all timber types, livestock will be excluded from plantations if excessive damage to the planted trees will result from grazing use of the area.

The aspen type is managed for commercial timber on this forest. As this type is particularly subject to damage by domestic livestock, measures will be taken to reduce or eliminate such damage. Instructions for specific action in the management of aspen under these circumstances are given in the Timber Management Guides (FSH 2-2442.8).

Wildlife

Guidelines stated in the wildlife management plan for the forest will be referred to when preparing for timber sales and when coordinating timber management objectives with proper wildlife management practices.

Clear cutting by patches or blocks increases fringe area and hence is beneficial to wildlife. Wildlife concentration areas will be avoided in selecting plantation sites, and the effect of plantations on wildlife food resources will be considered, particularly in the lower portions of the ponderosa pine type where wildlife winter range needs are critical.

Fish-producing streams will be retained in their natural condition.

COOPERATION WITH OTHER AGENCIES

The Forest Service has the responsibility for providing leadership to obtain good forest practices on all lands, whether they be Federal, State, or private. Every practical effort should, therefore, be made to assist other agencies or owners who manage forest land so that a better job of producing timber and other forest products can be accomplished.

Advantage should be taken of opportunities offered through the various Federal assistance programs to improve stocking of depleted private forest lands. State organizations in southern Colorado and in New Mexico will be encouraged in any effort they may make to promote beneficial forest practices on private land.

SUPPORTING DATA

History of Timber Use and Development

The present San Juan National Forest is a combination of the previous San Juan and Montezuma National Forests. These two forests were created by Presidential proclamation in June, 1905. They were combined into the present San Juan National Forest in July, 1947.

The first recorded timber cutting was before 1875 by two water-powered mills in the vicinity of Silverton. These and other early-day timber operations were usually in connection with construction work for mining activities. Extensive sawmilling was also carried on near the communities of Silverton and Rico. Prior to 1915, the total volume of timber cut from the area making up the Montezuma Forest and vicinity was approximately 150 MM B.F.

In 1901 a large mill was established in Pagosa Springs by the Pagosa Lumber Company. The Denver and Rio Grande Western Railroad completed its line into Pagosa Springs at that time. Most of the accessible ponderosa pine timber in the vicinity of Pagosa Springs and south into New Mexico was railroad-logged prior to 1918.

During the period 1924 to 1954, the ponderosa pine stands on the Dolores and Glade Districts were logged through a series of large timber sale offerings. These operations removed approximately 280 MM B.F., practically all the mature and overmature ponderosa pine on these two ranger districts.

Most of the accessible pine stands on the Piedra and Pine Blocks were logged during the period 1935 to 1955. These operations have since moved to the Upper Piedra River and the logs are hauled to the San Juan Lumber Company's new sawmill at Pagosa Springs.

The first large-scale spruce logging operation was started by the J. S. Weidman sawmill at Durango in 1946. Logs were hauled from the Hermosa Park and Missionary Ridge areas, and a steady logging and sawmilling operation still continues. Approximately 100 MM B.F. of sawtimber will be harvested from the Missionary Ridge area alone, when the first cut from this area is completed in about 1964.

Economy

The present economy of the San Juan Basin area is supported by agriculture, oil and gas production, mining, tourist travel, and forest products manufacture. This wide variety of resource wealth

forms a solid and reliable foundation for community growth. Present community populations are estimated as follows:

Town	Population	Principal Industry
Pagosa Springs, Colo.	1,000	Lumber manufacturing
Bayfield	200	Agriculture
Durango	12,000	Lumber, smelter, oil, agriculture
Mancos	800	Lumber, match factory, agriculture
Cortez	10,000	Oil, agriculture
Dolores	500	Lumber, agriculture
Rico	200	Mining, acid manufacturing plant
Silverton	600	Mining
Farmington, N. M.	30,000	Oil and gas, agriculture

The population of the San Juan basin area has more than doubled in the past 10 years. The population of Farmington, New Mexico has increased from 3,000 to 30,000 in a decade. Urban growth in Durango and Cortez has also been rapid, while the smaller communities and rural areas have remained about the same. Growth in the urban areas is continuing, and is expected to expand considerably when trans-continental highways through the area are improved and widened to facilitate tourist and motor freight transportation.

Physiography

The topography of the San Juan area is widely varied, including such features as great mesas, deep canyons, scenic snow-capped peaks, and rugged alpine terrain. Elevations range from 6,500 feet at the south boundary of the forest, to as high as 14,250 feet on Mt. Wilson.

Most of the forest soils derive from sedimentary rock formations. The foot mountains of the San Juan Range, for example, consist of tilted layers of sandstone and limestone formations which have been thrust upward and aside by the ascension of vast granitic batholiths which now protrude to form the high mountain crests. The soils are generally deep and fertile, an unusual situation for high mountain country. Timber growth of all species is exceptional on the better sites. South of Highway U. S. 160 there is a belt of highly erosible soil which is derived from Mancos shale. Other soils of the area are fairly stable but they are still subject to erosion if disturbed.

Climate

Situated at the southern end of the Central Rockies, the climate on the San Juan National Forest is relatively mild for mountain country. Winter temperatures seldom go below minus 20 degrees F. and summer temperatures in the pine belt occasionally reach 90 degrees. Annual precipitation varies from 18 inches in the pine zone to 32 inches at high altitudes.

Most of the precipitation comes in the form of snow, except that there is a regular summer rainy period extending from about July 26 to August 31 during which from 2 to $3\frac{1}{2}$ inches of precipitation occurs. June is a month of drought, with an average precipitation of only 0.5 inch at elevations which receive a total of 18 inches annually. Snow depths in the average winter vary from 30 inches to as much as 90 inches, depending upon elevation. Prevailing winds are from the southwest and are usually not severe. The mountain terrain above 9,500 feet is, however, sometimes subject to severe windstorms causing heavy damage to Engelmann spruce stands.

Table 6

REPORT OF TIMBER CUT AND SOLD ON SAN JUAN, MONTEZUMA AND DURANGO N. F.
(Present San Juan N. F.) SINCE 1915

Years	Timber Sold				Timber Cut			
	No. Sales	MBF	Value	Avg. Sell. Price	MBF	Value	Avg. Sell. Price	Receipts
1915 FY:	86	3,993:	7,013:	1.76:	4,098:	7,791:	1.90:	9,575
1916 FY:	122	14,218:	26,712:	1.88:	5,435:	11,004:	2.02:	14,315
1917 FY:	115	7,273:	17,817:	2.45:	6,658:	14,624:	2.20:	15,904
1918 FY:	118	6,044:	14,640:	2.42:	6,645:	15,225:	2.29:	16,230
1919 FY:	67	8,674:	20,325:	2.34:	6,327:	14,832:	2.34:	14,887
1920 FY:	115	12,536:	48,508:	3.87:	6,252:	17,701:	2.83:	20,802
1921 FY:	73	1,919:	7,032:	3.66:	8,045:	27,240:	3.39:	22,777
1922 CY:	52	680:	1,305:	1.91:	2,300:	7,413:	3.22:	4,909
1923 CY:	74	4,263:	12,796:	3.00:	2,324:	6,995:	3.01:	6,124
1924 CY:	75	81,874:	249,090:	3.04:	8,223:	26,576:	3.23:	28,699
1925 CY:	32	1,585:	4,773:	3.01:	11,249:	34,815:	3.09:	33,807
1926 CY:	56	8,388:	26,063:	3.11:	8,455:	26,901:	3.18:	24,732
1927 CY:	48	3,575:	9,253:	2.59:	11,953:	35,396:	2.96:	40,810
1928 CY:	44	32,395:	55,385:	1.71:	26,154:	75,184:	2.87:	70,307
1929 CY:	48	426:	1,596:	3.75:	14,073:	42,078:	2.99:	46,384
1930 CY:	72	213,812:	429,478:	2.01:	1,692:	4,935:	2.92:	32,435
1931 CY:	38	486:	1,415:	2.91:	1,318:	3,899:	2.96:	16,453
1932 CY:	34	138:	618:	4.48:	1,376:	3,932:	2.86:	1,317
1933 FY:	50	331:	709:	2.14:	1,420:	3,175:	2.24:	1,523
1934 FY:	69	20,359:	50,868:	2.50:	7,168:	21,299:	2.97:	1,547
1935 FY:	52	534:	1,248:	2.34:	9,756:	24,440:	2.51:	19,300
1936 FY:	53	11,927:	29,277:	2.45:	11,859:	29,339:	2.47:	27,915
1937 FY:	50	28,692:	73,068:	2.55:	14,515:	40,095:	2.76:	38,102
1938 FY:	61	60,625:	108,723:	1.79:	16,161:	34,090:	2.11:	36,032
1939 FY:	44	96,438:	193,616:	2.01:	23,254:	47,706:	2.05:	37,753
1940 FY:	50	1,734:	4,332:	2.50:	18,447:	38,728:	2.10:	32,526
1941 FY:	31	5,830:	15,064:	2.58:	13,719:	28,512:	2.08:	28,248
1942 FY:	58	24,677:	58,495:	2.37:	8,531:	20,989:	2.46:	22,888
1943 FY:	36	1,271:	3,503:	2.76:	14,877:	33,471:	2.25:	32,732
1944 FY:	42	14,425:	51,833:	3.59:	10,770:	25,834:	2.40:	24,107
1945 FY:	41	3,572:	12,294:	3.44:	10,630:	25,772:	2.42:	27,389
1946 FY:	71	19,605:	73,145:	3.73:	14,749:	45,601:	3.09:	48,545
1947 FY:	58	49,295:	190,354:	3.86:	24,501:	79,454:	3.24:	83,919
1948 FY:	55	30,849:	162,563:	5.27:	20,428:	81,630:	4.00:	84,353
1949 FY:	39	2,397:	12,399:	5.17:	16,714:	70,086:	4.19:	71,186
1950 FY:	55	9,292:	33,897:	3.65:	23,505:	97,028:	4.13:	97,889
1951 FY:	43	26,401:	132,773:	5.03:	30,817:	133,825:	4.34:	145,547
1952 FY:	37	10,719:	32,684:	3.05:	25,037:	104,187:	4.16:	102,158
1953 FY:	49	37,125:	181,826:	4.90:	26,643:	128,747:	4.83:	140,527
1954 FY:	42	23,418:	99,762:	4.26:	23,449:	108,536:	4.63:	115,038
1955 FY:	27	55,737:	263,316:	4.72:	29,211:	119,009:	4.07:	110,573
1956 FY:	-	57,093:	66,239:	1.16:	40,097:	136,733:	3.41:	152,176
1957 FY:	40	64,062:	557,721:	8.71:	53,692:	155,462:	2.90:	115,890
1958 FY:	38	62,491:	193,581:	3.10:	26,460:	145,133:	5.48:	168,563
1959 FY:	59	88,418:	592,280:	6.70:	49,747:	350,193:	7.04:	365,552

Compartment List for San Juan Working Circle
San Juan National Forest

1 - Glade Block

001 Sand Rock
002 Big Water
003 Dove
004 Glade
005 Black Snag
006 Disappointment
007 Far Draw
008 Doe Park
009 Narraguinnep
010 Long Park
011 Cabin
012 Salter
013 Trimble
014 Biggs
015 House Creek
016 Boggy Draw
017 Beaver
018 Ground Hog

2 - Dolores Block

019 Dry Creek
020 Upper Stoner
021 Taylor Mesa
022 Little Taylor
023 East Stoner
024 West Stoner
037 Roaring Fork
038 Section House
039 Priest Gulch
040 Slope
041 Ryman
042 Scotch Creek
043 Burnett
044 Horse Creek
045 Morrison
046 Fall Creek
047 Geyser
048 John Bull
049 Sulphur
050 West Dolores
051 Willow Divide
052 Black Mesa
053 Lone Cone
054 Mid Peak
055 Wild (Dolores)
056 Dunton
057 Kilpacker
058 Truby
059 McJunkin
060 Silver
061 Barlow
062 Slate
063 Lizard Head
064 Flattop
065 East Dolores

3 - Mancos Block

025 Spruce Water
026 Burnt Logs
027 Lost Canyon
028 W. Turkey Cr.
029 Chicken Cr.
030 West Mancos
031 Middle Mancos
032 Cherry Creek
033 Hesperus
034 Fish Creek
035 Upper Lost Canyon
036 W. Bear Creek

4 - Columbine Block

066 Cascade
067 South Mineral
068 Ophir
069 North Mill Creek
070 Red Mountain
071 North Bear
072 Maggie
073 Elk Creek
074 West Lime
075 Deer Creek
076 Crater Lake
077 Wilderness (Columbine)
078 Lime Creek
079 Potato Hill
080 Reservoir
081 Pinkerton
082 Hermosa
083 Dutch Creek
084 Little Elk
085 Big Lick
086 Elbert
087 East Cross
088 Hermosa Park
089 Grassy
090 Black Canyon
091 Corral
092 Hotel
093 West Cross
094 Spruce
095 Big Bend

5 - Animas Block

096 Deer Creek
097 South Fork
098 La Plata
099 Lightner
100 Deep Creek
101 Junction Creek
102 Clear Creek
103 Buck Creek
104 Falls Creek
105 Haflin
106 Stevens
107 West Red Creek
108 Shearer
109 Young's
110 Coon Creek
111 Bear Creek
112 Canyon Creek
113 Tank Creek
114 West Florida
115 Grant
116 East Florida
117 Miller

6 - Pine Block

118 East Red Creek
119 Grimes
120 Vallecito
121 Wilderness (Pine)
122 East Mountain
123 Pine River
124 High Point
125 East Creek
126 Lion Creek
127 Wilson
128 Little Bear
129 East Bear Creek
130 Upper Beaver
131 North Beaver
132 South Beaver
133 Saul's Creek
134 Lange Canyon
135 Armstrong
136 Crowbar
137 Ute Creek
138 Green Canyon
139 Spring Creek

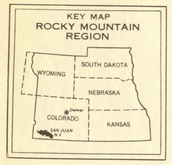
7 - Piedra Block

140 Ignacio
141 Fosset Gulch
142 Stollsteimer
143 Devil Mountain
144 Mule Mountain
145 Yellowjacket
146 Indian Creek
147 Sheep Creek
148 First Fork
149 Mosca Creek
150 Cold Creek
151 Horse Mountain
152 West Devil Creek
153 Chris Mtn.
154 Burns Canyon
155 Martinez Creek
156 O'Neal Park
157 Cottonwood Creek
158 Pagosa Creek
159 Corral Mountain
160 Sand Creek
161 Little Sand Creek
162 Middle Fork
163 Williams Creek
164 Shaw Creek
165 Wilderness (Piedra)

8 - Pagosa Block

166 Wilderness (Pagosa)
167 Fourmile
168 Turkey Creek
169 San Juan
170 Wolf Creek
171 East Fork
172 Elwood
173 Quartz Creek
174 East Sand Creek
175 Stymie
176 Coal Creek
177 Fawn Gulch
178 Mill Creek
179 Porcupine
180 Little Blanco
181 Upper Blanco
182 Fish Lake
183 Blue Lake
184 Hughes
185 Blanco Basin
186 Squaretop
187 Echo Canyon
188 Eightmile Mesa
189 Archuleta
190 Valle Seco
191 Coyote Park
192 Spiler
193 Winter Hills
194 Lower Blanco
195 Spence Creek
196 Navajo Peak

KEY MAP
ROCKY MOUNTAIN REGION



U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RICHARD E. MC ARDLE, CHIEF

SAN JUAN NATIONAL FOREST
COLORADO
NEW MEXICO PRINCIPAL MERIDIAN
1960

Scale 0 5 0 5 10 Miles

FOREST SERVICE MAP - CLASS "A"

Prepared by U.S.F.S. at Regional Office, Denver, Colorado, 1959-60 from Forest Service & U.S.C.S. Planimetric Maps and U.S.G.S. Topographic maps, constructed by photogrammetric methods using aerial photographs.
Control by U. S. Coast and Geodetic, U. S. Geological & U. S. Forest Service Surveys.

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COMPARTMENT MAP OF THE SAN JUAN WORKING CIRCLE

LEGEND

Block Boundary
Compartment Bndry.
Revised 12/1960

1-GLADE BLOCK
2-DOLORES BLOCK
3-MANCOS BLOCK
4-COLUMBINE BLOCK
5-ANIMAS BLOCK
6-PINE BLOCK
7-PIEDRA BLOCK
8-PAGOSA BLOCK

UNCOMPAHGRE PRIMITIVE AREA
WILSON MOUNTAINS PRIMITIVE AREA
WEMINUCHE WILDERNESS
SAN JUAN PRIMITIVE AREA
MESA VERDE NATIONAL PARK
SOUTHERN UTE INDIAN RESERVATION
COLORADO NEW MEXICO STATE LINE